Growth, inactivation and histamine formation of Morganella psychrotolerans and Morganella morganii - development and evaluation of predictive models

Mathematical models for growth, heat inactivation and histamine formation by Morganella psychrotolerans and Morganella morganii were studied to evaluate the importance of these bacteria in seafood. Curves for growth and histamine formation by M. psychrotolerans in broth and seafood were generated at constant and changing storage temperatures (n=12).

Observed and predicted times to formation of 100, 500 and 2000 ppm histamine were used for evaluation of an existing M. psychrotolerans histamine formation model [Emborg, J., Dalgaard, P., 2008-this issue-this issue. Modelling and predicting the growth and histamine formation by Morganella psychrotolerans. International Journal of Food Microbiology. doi:10.1016/j.ijfoodmicro.2008.08.016] Growth rates for M. psychrotolerans and M. morganii were determined at different constant temperatures from 0 degrees C to 42.5 degrees C whereas heat inactivation was studied between 37.5 degrees C and 60 degrees C. A M. morganii growth and histamine formation model was developed by combining these new data (growth rate model) and data from the existing literature (maximum population density and yield factor for histamine formation). The developed M. morganii model was evaluated by comparison of predicted growth and histamine formation with data from the existing literature. Observed and predicted growth rates for M. psychrotolerans, at constant temperatures, were similar with bias and accuracy factor values of 1.15 and 1.45, respectively (n = 11). On average times to formation of critical concentrations of histamine by M. psychrotolerans were acceptably predicted but the model was not highly accurate. Nevertheless, predictions seemed useful to support decisions concerning safe shelf-life in relation to formulation, storage and distribution of chilled seafood. Parameters for the effect of temperature on growth and inactivation of M. psychrotolerans and M. morganii differed markedly with T-min of -8.3 to -5.9 degrees C vs. 0.3 to 2.8 degrees C, T-opt of 26.0 to 27.0 degrees C vs. 35.9 to 37.2 degrees C and T-max 32.0 to 33.3 degrees C vs. 44.0 to 47.4 degrees C. D-50 degrees C of 5.3 min vs. 13.1 min and z-values of 6.8 degrees C and 7.2 degrees C. At temperatures above similar to 15 degrees C M. morganii grew faster than M. psychrotolerans. Bias- and accuracy factor-values of 1.41 and 2.44 (n = 93) showed the predicted growth of M. morganii to be faster than previously observed in fresh fish and broth. In agreement with this, predicted times to formation of critical histamine concentrations by M. morganii were on average shorter than observed in fresh fish. A combined model was suggested to predict histamine formation by both psychrotolerant and mesophilic Morganella during storage of fresh fish between 0 degrees C and 37 degrees C.

General information
Publication status: Published
Organisations: Section for Aquatic Microbiology and Seafood Hygiene, National Institute of Aquatic Resources
Contributors: Emborg, J., Dalgaard, P.
Pages: 234-243
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: International Journal of Food Microbiology
Volume: 128
Issue number: 2
ISSN (Print): 0168-1605
Ratings:
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.442 SNIP 1.509
Web of Science (2008): Indexed yes
Original language: English
Keywords: Prediction, Product validation, Seafood safety, Heat inactivation
DOIs:
10.1016/j.ijfoodmicro.2008.08.015
Source: orbit
Source ID: 225372
Research output: Contribution to journal › Journal article – Annual report year: 2008 › Research › peer-review